Botanical Notes from Bainbridge, Georgia.

By Aug. F. Foerste.

Rectangular Inflorescences.—Nature is usually a graceful designer. Many flowers rather stiff and insignificant in themselves become charming from the skillful taste with which they are arranged in inflorescences. Upon a person accustomed to be alert in seeking the beauties of nature, the first sight of *Siphonychia diffusa*, Chapman, produces a queer effect, half of surprise and half of discomfort. Here is a plant with its flowers laid out in rectangular inflorescences—cymes with a flat top, with quadratic outlines, or of a form which at once makes us wish to say parallelopipedon, as though the other dimensions were equally stiff and rectangular. In these rectangles the flowers are laid off almost with the precision of corn rows in a field. This general effect is not lessened, in what seems a vain attempt of nature at grace, by the way in which these rectangular inflorescences are arranged on the stem; for, the stems being almost prostrate, all the branches being terminated by inflorescences at such heights as to bring all the inflorescences to within approximately the same plane, and the inflorescences being all disposed with their diagonals vertical or parallel to the stem, their sides all become parallel, so that the final effect is that of a series of rectangular fields, set out in some Western landscape, where all lines run north and south or east and west. In the case of this plant, we might say northeast and southwest, northwest and southeast. The fact that adjacent cymes are sometimes disposed at slightly different levels, suggests the effects of hillsides. The plant must be seen to be appreciated. It should occur in every botanical garden.

The lower branches consist of, first, two opposite leaves, bearing in the axil nearest the stem an inflorescence about half the size of the two inflorescences into which the other branches divide. The flowers usually terminate the seventh node from the main stem, all the terminal buds of the branchlets except the last being terminated by abortion at the end of each node, so that the cyme is a product of seven successive branchings of the stem.

A curious Correllation between Sympodial Development of Branches and the Retention of Stipules in Leguminosæ.—Two

species of *Crotallaria* were examined. In both cases the flowering peduncles representing the end of the stem are attached directly opposite the axil of a leaf, but usually a little below its level; one leafy branch arises from the axil of this leaf, and assuming the same direction as the stem apparently terminates it; another leafy branch starts from the axil of the leaf below, and is evidently axillary; four nodes intervene between successive flowering peduncles, so that the order of arrangement of the stem after it begins flowering: is two leaves usually without anything in their axils, a third leaf with a leafy branch in its axil, and a final fourth leaf with a leafy branch in its axil and the terminal flowering pedicel beyond the fourth leaf.

C. sagittalis, L., has long, narrow, inversely sagittate stipules, whose decurrent margins reach the node below in every case except along the first internode of each sympodial branch, which continues the leafy growth of the stem after the flowering peduncle has been thrust aside. Along this internode the decurrent margins of the stipules extend only half way down the internode, and in rare instances are confined only to the very top of this internode. These leafy continuations of the stem being in each case branches, though sympodial, of course have the first leaf of their one-half phyllotaxy in a lateral position, causing the decurrent margins of the stipules of the first internodes to be pressed by the front of the subtending leaf and the back of the flowering peduncles, and this may account for the abortion of part of its decurrent stipular growth.

C. ovalis, Pursh., offers in this respect a more interesting case. Here the two lower nodes show only the merest traces of stipules at the node itself. The third node at times has the stipules likewise almost obsolete, but usually the stipules are present, though of small size and decurrent for only half the length of the internode; much more rarely the stipules of this node nearly equal those of the fourth node. The fourth node always has the inversely sagittate and rather conspicuous stipules fully developed and the decurrent margins extending to the next lower node. In this case the suppression of the two lower stipules and of the lower part of the decurrent margins of the third can be less readily accounted for, and their full retention at the node preced-

ing sympodial development is interesting. The number of instances in which flowering peduncles of Leguminosæ are extra-axillary through sympodial growth is rather larger than at first suspected. The Germans call these *uebergiphelte* inflorescences. The word sympodial expresses the opposite of these relations and is therefore not a good term with which to designate such inflorescences. Some better English term, meaning *thrust aside*, should be sought, and used in the manuals of botany for the many cases where such inflorescences occur. This would be a way to advance morphological botany. Unless such a word can be found, perhaps the term *superseded inflorescences* might do.

Cotton.—The cotton plant is of course so well understood that nothing of botanical interest can be added to our information. Attention is only called to the fact that the inflorescences here are again morphologically terminal, *superseded* by the sympodial growth of axillary branches. The flower of the upland cotton, *Gossypium album*, Ham., is pale yellowish or greenish white early in the morning. Towards noon it becomes tinged with rose, and in the later afternoon it is of a strong rose-red color. Changes of color of plants on fading indicate possibilities as to the normal colors of flowers in the distant future, or earlier by process of selection. Nature often has solved this problem already by giving to one species a color as a normal color which another species of the genus secures only on fading. In the Sea Island cotton, *G. nigrum*, Ham., the deep rose-red color is found normally, but only as blotches at the base of the petals on the inside. It would be easy to produce cotton with rose-red flowers.

The Practical Utilization of Phyllotaxy in Tobacco Culture. As soon as the flower buds of tobacco begin to appear quite generally in the fields, the tops of the tobacco plants are cut off. Depending upon the vigor of the plant, the existing conditions of rain, soil, etc., the plants are topped at various heights. An expert tobacco grower will top plants at heights varying with the vigor of the individual plants. When, however, he sends a less experienced "hand" into the field, as often he must, he looks at the field as a whole, and then instructs the hand to top the tobacco at the eighth, tenth or twelfth leaf, as the case may be. The hand, of course, does not stop to count. He looks at

once for the ninth leaf, which is directly over the first, since the phyllotaxy is three-eighths. The eighth leaf is then the next one below, and the tenth the next one above, while the twelfth is directly above the space between the ninth and the tenth leaf.

In certain seasons it is found that the leaves are not going to mature equally from insufficient rain or other reasons. In that case some men remove the lower leaves nearest the ground, which are apt to ripen too fast under such circumstances. Other planters prefer to leave the lower leaves on, believing that they protect those above from dirt in case of splashing during rain. The more observant planters, however, know that the lower three leaves come beneath the spaces between the next three leaves, so that there is really no protection offered, as any one can see from the phyllotaxy, and so they cut the lower leaves off if the leaves are maturing too unequally. The planters have not studied the theoretical phyllotaxy, but they understand its practical applications.

Renewed Growth of Trees in Summer after having already once formed their Terminal Scaly Winter Buds.—Of course, scaly winter buds are designed by nature to protect the undeveloped tips of branches during the winter months. Moreover, the scales represent leaves, and that in a crude, undeveloped form, in what is called at times an arrested state of development, as more than necessary cases will readily demonstrate. And finally, hardly any one will deny that the presumption is in favor of a time when plants, and among them probably ligneous plants, did not possess any winter buds, but got along the best they could, freezing and hence dying back in colder climates, and more successfully bridging the non-growing season in more tropical regions. The development of winter buds must have been a gradual one, and it must have taken some time before they began the development of terminal scaly buds early enough to have made the matter very effective, and still longer before these buds were developed with the greatest economy of material and the greatest efficiency as protectors to the life within. At one time there must have been a very direct connection in time between the causes necessitating winter protection and the efforts of the plants to secure such a protection. What it is desired to especially bring under notice here is the fact that at present in ligneous plants this direct

relation, though still apparent, shows the curious anomaly of presenting the effect in early spring and the cause not until the succeeding winter. In other words, in many ligneous plants the warmth of returning spring has hardly called the vital functions of the trees again into vigorous action before the growth for the year is completed, and a few weeks later a well-developed terminal scaly bud awaits the winter. Of course, this bud itself needs considerable maturing before it will attain all the characters necessary to endure the winter's cold, and the parts the scales of the bud are intended to protect must still, in a large measure, be developed. But the fact that the more terminal leaves have remained in the crude state of scales when all the freshness of spring was inviting them on to full development to vigorous leaves can not be overlooked. Nature is thus shown to plan for the future, and, to follow this metaphor, she can be said to be prescient, taking cognizance for the future, laying in her stores at a time when they are not needed, for future use. This is true in so many ways that it cannot fail to have attracted attention. It is mentioned here to explain another set of related phenomena.

A study of the new growth of the jack oak, *Quercus nigra*, L., in spring will show that the plant has the work for the present year all planned out. The growth of the year is already practically contained in the scaly buds. Before this year's growth is fully accomplished she begins to prepare for the next year's task, and she lays out only enough work to meet the requirements. The result is that there is a certain definiteness to this work, so that it is possible in a certain measure to foretell how much the plant will do from year to year. This definiteness must bear relations to conditions of climate found in certain areas from over the plant's range of distribution. In the case of many plants these conditions seem to be found over their more northern areas of distribution. The result is that northward the relations between the requirements as to the number of leaves necessary for the vigorous development of the plant and the provisions for the same are so well cared for in the amount of growth the plant arranges for from year to year that it is rather rare to find ligneous plants renewing their growth after having once formed their terminal buds. The correlations established for more northern areas lose in value,

however, in going southward, and the result is that in the South many ligneous plants, after having already formed their terminal buds in the spring, begin to develop new growth again in the summer months, and again form terminal buds. Under exceptional conditions this may take place three or four times in the course of a year.

The black jack oak already mentioned forms a curious instance. It is very common, practically a weed on some plantations near Bainbridge. Cases of repeated renewal of growth are very common here. In the older trees growth has taken place twice during this year in the case of certain branches, each time with the formation of a terminal bud. In young sprouts coming up from the roots this renewal of growth has been quite general, common enough to present at least a few examples from any accidental point of view on the plantation. In some limited localities renewed growth has been almost general. In a case where a conflagration by destroying the growth of the present year had for a considerable time checked development, adventitious shoots have come forth, and have three times, in some cases four times, formed terminal scaly buds. It is interesting to notice how nearly equal is the number of internodes developed each time. It is a striking proof of the fact that this oak has by continual habit so developed the custom of producing a certain set of internodes and then a terminal bud, that the oak goes through this spasmodic repetition of growth and termination by winter buds, even at times when nature is favorable to a single longer continued growth, before winter buds *need* be prepared.

The dogwood, *Cornus florida*, L., may be mentioned as a similar instance, since its new growth is short and quickly formed, and composed of a fairly definite number of nodes. Some branches occasionally show evidences of two growths during one year.

The persimmon, *Diospyros Virginiana*, L., is also interesting. It is very common here as young low bushes, almost a weed, though not troublesome to the same extent as jack oaks. The number of internodes formed is much greater than in oaks, and is not so definite; only a moderate number of the nodes developed during each period of growth, being actually already indicated in the terminal bud. Still it is a good case, since cases of renewed

growth after the terminal scar had been once formed are rather frequent in some areas, and are not rare anywhere. Probably the longer season southward, with abundant moisture, has considerable to do with it.

In the case of vigorous sprouts or shoots this tendency to renewed growth is naturally emphasized, as already noticed in the case of the jack oak. New shoots from a hickory stump presented another interesting phase of the subject. On the very same stump, with sprouts all of the same age, were found a few which had made their long growth during a single uninterrupted period. In one shoot the internodes moved closer together and the leaves grew smaller towards the middlle of its length, evidently preparatory to the formation of a terminal bud; but the shoot changed its mind, and the succeding leaves became more distant and larger until, later, the real terminal bud was formed considerably farther on. In another shoot the leaves were reduced to scales towards the middle of the shoot, but the internodes were still a little too great to admit of the formation of a scaly bud at this point. While in several cases the shoots had actually developed scaly terminal buds at one time, and later these had renewed growth; and, in a single shoot, growth had taken place spasmodically at three separate intervals.

In the case of the black jack oaks which had suffered from a conflagration, and later had sent out shoots, the new branches were exceptionally vigorous. If a plant ever bears superposed buds it is almost certain to show them in such instances. The failure of these shoots to show them makes it very improbable that superposed buds ever occur in jack oaks. Instead of that was found what usually under such circumstances is the alternative, the development of two additional but lateral buds. Since no evident leaves normally subtend the two lateral buds and the scales in oak buds represent only stipules, it was difficult at first to determine whether we have here a case of lateral dedoublement or of branching from the lowest axils of the central, usually larger bud. That the latter was the case was shown, however, by the presence, in several instances, of single full developed, large leaves in a lateral position at the base of the central bud, but subtending one of these lateral buds, while everything else about the various buds was in

the form of the usual scales. In one instance the central bud had developed a single—the lowest—internode, and bore at the top of this internode, in the axil of the first scale, a small lateral bud, thus making with the two lower lateral buds a group of four scaly buds in this leaf axil.

Possibly palæobotany may some day shed light on the evolution of scaly winter buds. So far the fossil branches of dicotolydenous plants have been practically ignored. In the future they will no doubt be used to give corroborative evidence to the testimony as given by leaves alone, and we may hope for the day when the winter buds, wherever preserved, will be carefully studied.

Dropsical Pelargoniums.*

For the past two or three years there has been an increased number of complaints made to the Experiment Station of a disease among the hot house *Pelargoniums*. Specimens received from at least a dozen places all agree in the chief essentials, while there are many variations in the details of appearance to the unassisted vision.

While the trouble is most noticeable upon the leaf blades it is by no means confined there. Upon the stem it shows itself in peculiar corky ridges which are not unfrequent upon the petioles. Upon the blades the usual appearance is that of numerous specks which seem to be supercharged with water giving to those parts a clear amber look when held up to the light. The first thought was of bacteria, there being a resemblance of the watery glands to specks found in the carnation leaves previously studied and known to be due to micro-organisms.

After making a full test for bacteria and failing to secure germs or any signs of contagion by inoculation it was concluded that the *Pelargoniums* were suffering from a dropsical affliction, and instead of the trouble being due to any parasite it seems to be entirely physiological. Photo-impressions were taken of the leaves showing different phases of the disorder.

In a green-house devoted entirely to *Pelargoniums* the trouble

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